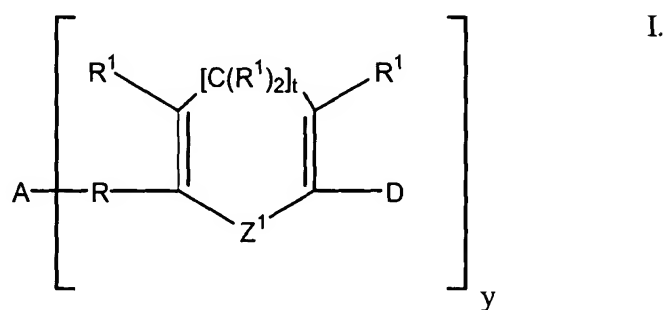


CLAIMS

What is claimed is:

1. A radiation-curable composition, comprising a cationic photoinitiator and a radiation-curable polymer represented by Structural Formula I:



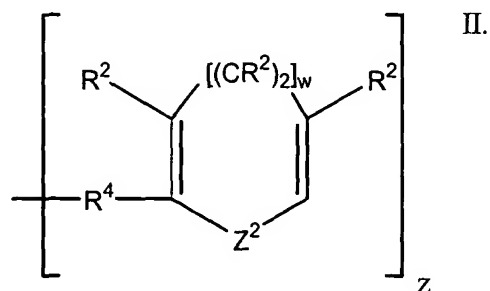
wherein:

A is a substituted or unsubstituted hydrocarbon;

R is a polymer chain;

Z¹ is selected from the group consisting of -O-, -S- and -NR⁷-;

D is -H or a group represented by Structural Formula II:



Z² is selected from the group consisting of -O-, -S- and -NR⁸-;

R¹ and R² for each occurrence are, independently, selected from the

group consisting of -H, -OR⁵, -NR⁵R⁶, a substituted or unsubstituted alkyl, a substituted or unsubstituted cycloalkyl, and a substituted or unsubstituted heterocycloalkyl;

5 R⁴ is selected from a substituted or unsubstituted alkylene, a substituted or unsubstituted cycloalkylene, a substituted or unsubstituted heteroalkylene, and a substituted or unsubstituted heterocycloalkylene;

R⁵ and R⁶ are each, independently, selected from the group consisting of -H, a substituted or unsubstituted alkyl, a substituted or unsubstituted cycloalkyl, and a substituted or unsubstituted heterocycloalkyl; or

10 R⁵ and R⁶ together with the nitrogen to which they are attached form a substituted or unsubstituted heterocycloalkyl; and

R⁷ and R⁸ are each, independently, selected from the group consisting of -H, a substituted or unsubstituted alkyl, a substituted or unsubstituted cycloalkyl, and a substituted or unsubstituted heterocycloalkyl;

15 t and w are each independently 0 or an integer from 1-5; and
y and z are each, independently, a positive integer.

2. The composition of Claim 1, wherein:

Z¹ is -O-;

t is 0;

20 D is -H;

R is a polymer chain wherein at least 50% of the repeating units of the polymer chain are isobutylene units;

R¹ for each occurrence is -H;

y is 2 or 3; and

25 A is a divalent or trivalent phenyl.

3. The composition of Claim 1 wherein:

Z¹ is -O-;

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t is 0;

D is a group represented by Structural Formula II;

Z² is -O-;

w is 0;

5 R is a polymer chain wherein at least 50% of the repeating units of the polymer chain are isobutylene units;

R¹ and R² for each occurrence are -H;

R⁴ is an alkylene;

y is 2 or 3;

10 z is 1; and

A is a divalent or trivalent phenyl.

4. The composition of Claim 1 wherein:

Z¹ is -S-;

t is 0;

15 D is -H;

R is a polymer chain wherein at least 50% of the repeating units of the polymer chain are isobutylene units;

R¹ for each occurrence is -H;

y is 2 or 3; and

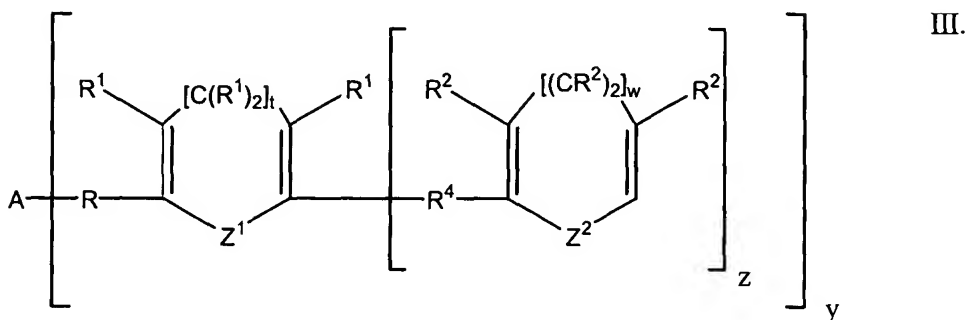
20 A is a divalent or trivalent phenyl.

5. The composition of Claim 1, wherein the cationic photoinitiator is selected from the group consisting of an onium salt, a diaryliodonium salt of sulfonic acid, a triarylsulfonium salt of sulfonic acid, a diaryliodonium salt of boric acid, and a triarylsulfonium salt of boric acid.

25 6. The composition of Claim 5, wherein the cationic photoinitiator is diaryliodonium hexafluoroantimonate.

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7. A radiation-curable polymer represented by Structural Formula III:



wherein:

A is a substituted or unsubstituted hydrocarbon;

R is a polymer chain;

Z¹ is selected from the group consisting of -O-, -S- and -NR⁷-;

Z² is selected from the group consisting of -O-, -S- and -NR⁸-;

R¹ and R² for each occurrence are, independently, selected from the group consisting of -H, -OR⁵, -NR⁵R⁶, a substituted or unsubstituted alkyl, a substituted or unsubstituted cycloalkyl, and a substituted or unsubstituted heterocycloalkyl;

R⁴ is selected from a substituted or unsubstituted alkylene, a substituted or unsubstituted cycloalkylene, a substituted or unsubstituted heteroalkylene, and a substituted or unsubstituted heterocycloalkylene;

R⁵ and R⁶ are each, independently, selected from the group consisting of -H, a substituted or unsubstituted alkyl, a substituted or unsubstituted cycloalkyl, and a substituted or unsubstituted heterocycloalkyl; or

R⁵ and R⁶ together with the nitrogen to which they are attached form a substituted or unsubstituted heterocycloalkyl; and

R^7 and R^8 are each, independently, selected from the group consisting of -H, a substituted or unsubstituted alkyl, a substituted or unsubstituted cycloalkyl, and a substituted or unsubstituted heterocycloalkyl;

t and w are each independently 0 or an integer from 1-5; and

5 y and z are each, independently, a positive integer.

8. The polymer of Claim 7 wherein:

Z^1 and Z^2 are -O-;

t and w are 0;

10 R is a polymer chain wherein at least 50% of the repeating units of the polymer chain are isobutylene units;

R^1 and R^2 for each occurrence are -H;

R^4 is an alkylene;

y is 2 or 3;

z is 1; and

15 A is a divalent or trivalent phenyl.

9. The polymer of Claim 8, wherein R^4 is methylene or dimethylmethylene.

10. The polymer of Claim 7 wherein:

Z^1 and Z^2 are -S-;

20 t and w are 0;

R is a polymer chain wherein at least 50% of the repeating units of the polymer chain are isobutylene units;

R^1 and R^2 for each occurrence are -H;

R^4 is an alkylene;

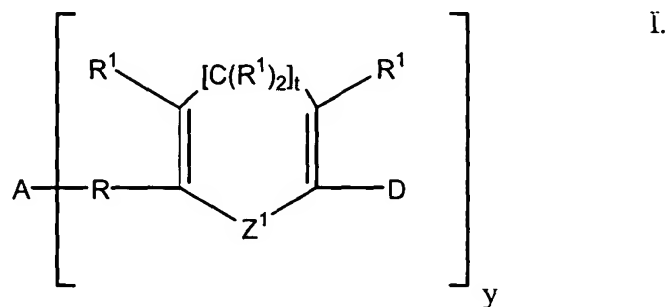
25 y is 2 or 3;

Z is 1; and

A is a divalent or trivalent phenyl.

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11. The polymer of Claim 10, wherein R^4 is methylene or dimethylmethylene.
12. A method of forming a radiation-curable polymer, represented by Structural Formula I:



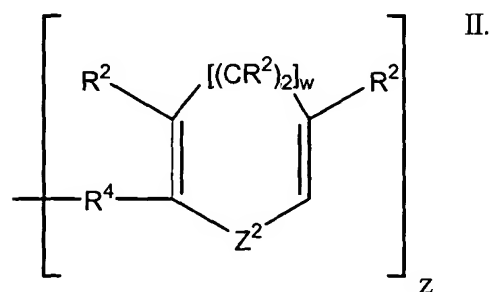
wherein:

A is a substituted or unsubstituted hydrocarbon;

R is a polymer chain;

Z^1 is selected from the group consisting of -O-, -S- and $-NR^7$ -;

D is -H or a group represented by Structural Formula II:



Z^2 is selected from the group consisting of -O-, -S- and $-NR^8$ -;

R^1 and R^2 for each occurrence are, independently, selected from the group consisting of -H, $-OR^5$, $-NR^5R^6$, a substituted or unsubstituted alkyl, a substituted or unsubstituted cycloalkyl, and a substituted or unsubstituted heterocycloalkyl;

R^4 is selected from a substituted or unsubstituted alkylene, a substituted or unsubstituted cycloalkylene, a substituted or unsubstituted heteroalkylene, and a substituted or unsubstituted heterocycloalkylene;

R^5 and R^6 are each, independently, selected from the group consisting of -H, a substituted or unsubstituted alkyl, a substituted or unsubstituted cycloalkyl, and a substituted or unsubstituted heterocycloalkyl; or

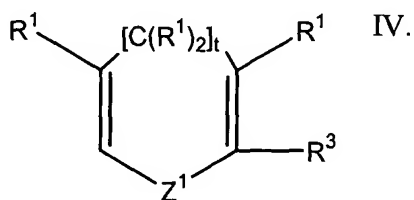
R^5 and R^6 together with the nitrogen to which they are attached form a substituted or unsubstituted heterocycloalkyl; and

R^7 and R^8 are each, independently, selected from the group consisting of -H, a substituted or unsubstituted alkyl, a substituted or unsubstituted cycloalkyl, and a substituted or unsubstituted heterocycloalkyl;

t and w are each independently 0 or an integer from 1-5; and

y and z are each, independently, a positive integer, comprising the steps:

- a) contacting under reaction conditions a cationically polymerizable monomer with a cationic polymerization catalyst to produce a living polymer; and thereafter;
- b) reacting the living polymer with an end capping compound having the following structural formula:



wherein:

R^3 is is $-\text{Sn}(\text{R}^{18})_3$, $-\text{Si}(\text{R}^{18})_3$ or $-\text{D}$, thereby forming the radiation-curable polymer.

13. The method of Claim 12, wherein an initiator is contacted with a cationic polymerization catalyst under reaction conditions followed by addition of the cationic polymerizable monomer.
14. The method of Claim 13 wherein:
- 5 the initiator is a substituted benzene having from one to three 1-chloro-1-methylethyl groups and from zero to about three t-butyl groups; and
- the cationic polymerization catalyst is TiCl_4 or BCl_3 .
15. The method of Claim 14, wherein:
- 10 Z^1 and Z^2 are -O-;
- t and w are 0;
- R^3 is -D and is a group represented by Structural Formula II;
- R^4 is an alkylene;
- z is 1; and
- the living polymer comprises at least 50% isobutylene units.
16. The method of Claim 14, wherein:
- 15 Z^1 and Z^2 are -S-;
- t and w are 0;
- R^3 is -D and is a group represented by Structural Formula II;
- 20 R^4 is an alkylene;
- z is 1; and
- the living polymer comprises at least 50% isobutylene units.
17. A radiation-curable polymer prepared by the method of Claim 12.

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